

LAKE COUNTY, ILLINOIS

2010 McDONALD WOODS LAKE 1

SUMMARY REPORT

PREPARED BY THE
LAKE COUNTY HEALTH DEPARTMENT
POPULATION HEALTH ENVIRONMENTAL SERVICES



McDonald Woods Lake #2, 2010

McDonald Woods Lake 1 (MC1) is part of the McDonald Woods Forest Preserve. The preserve was purchased in the 1970's and named after its former owner A.B. McDonald. The lake, which is situated at the top of its watershed, was formed from an existing wetland area by placing a weir at the east end of the lake, which divided it from

the current McDonald Woods Lake#2, which is discussed under separate report. At approximately the same time the wetland was divided and impounded, development of MC1's 195.8 acre watershed ensued. Lake County Health Department has monitored MC1 in 2003, 2006 and this past year, 2010. Previous reports can

be found at our webpage (see link on page 8).

Under state standards, MC1 is considered an impaired waterbody by the Illinois Environmental Protection Agency (IEPA) for the following parameters: phosphorus, low dissolved oxygen and high pH. While water clarity was very good, at times to the bottom of the lake, the impair-

SPECIAL POINTS OF INTEREST:

- *Nutrients*
- *Total Phosphorus*
- *Low Dissolved Oxygen*
- *Chlorides*

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LAKE FACTS**MAJOR TRIBUTARIES**

MILL CREEK

WATERSHED

DES PLAINES

SUB-WATERSHED

NORTH MILL CREEK

RECEIVING**WATERBODY**MCDONALDS WOOD
LAKE #2**SURFACE AREA**

8.6 ACRES

SHORELINE LENGTH

0.48 MILES

MAX DEPTH

2.5 FT.

AVERAGE DEPTH

2.0 FT (ESTIMATE)

LAKE VOLUME:17.2 ACRE-Feet
(ESTIMATE)**LAKE TYPE:**

IMPOUNDMENT

WATERSHED AREA

195.8 ACRES

MAJOR LANDUSESSINGLE FAMILY
FOREST AND GRASSLAND**BOTTOM OWNERSHIP**

LCFPD

MANAGEMENT ENTITY

LCFPD

**CURRENT AND
HISTORICAL USES**
AESTHETICS**ACCESS**

SHORELINE ONLY

SUMMARY CONTINUED.

ments are likely due to nutrient inputs from the expansive watershed feeding into MC1 as well as the dense aquatic vegetation inhabiting the lake.

MC1 is used by the LCFPD to provide visitors an aesthetically pleasing viewscape and benefits habitat for wildlife utilizing the area, animals such as beaver, red eared slider, green frog, damsel and dragonflies, butterflies are among those species noted along areas by the lake as

well as a variety of bird species such as the kingfisher, marsh wren and green heron, double crested cormorant and great blue heron.

**WATERSHED**

The approximate watershed of MC1 is 196 acres (Figure 1). Sixty-one percent of the watershed is represented by developed land uses; single family, transportation or government and institutional. The dominant land uses are single family and forest and grassland. However, when evaluating the land uses which contribute the greatest percent total of runoff to MC1, single family and transportation dominate. As expected with a large ratio of watershed to lake, the lakes retention time (lake volume/run off) is quite short, 39 days. The presence of a beaver dam at the weir outlet may affect the water the retention time of MC1.

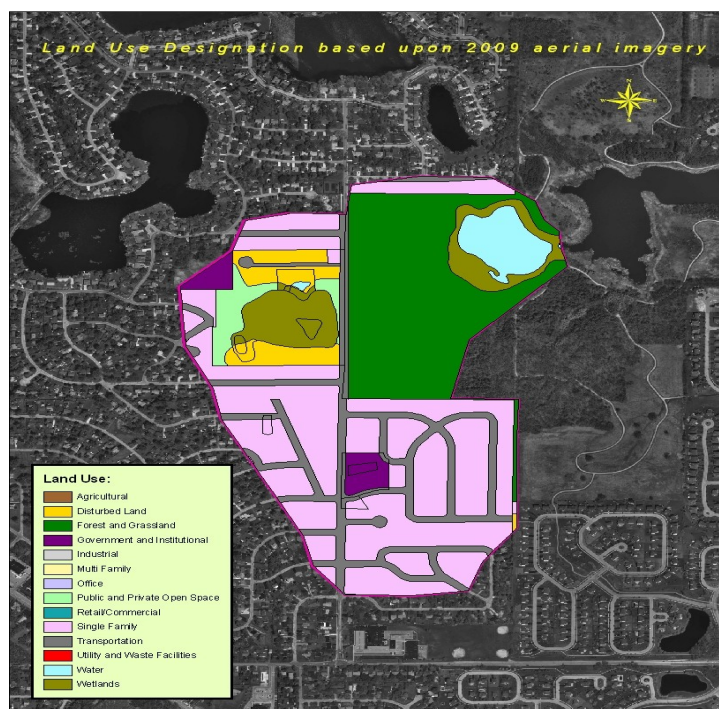


Figure 1. Estimated watershed and land use of MC1, 2010

WATER CLARITY AND TOTAL SUSPENDED SOLIDS

The water clarity in MC1 was excellent. Secchi depths ranged from 0.62 feet to 2.00 feet during the monitoring season. In June and July, plants obstructed the Secchi reading, which affected the average Secchi depth measured for the 2010 monitoring season (1.39 ft). The maximum depth measured in the lake in 2010 was 2.5 feet. Other lakes in the county that had Secchi depths recorded at greater depths did not necessarily have better water clarity due to these obstructions. It is important to note that the Secchi depth was near bottom at times during monitoring visits, especially during the latter part of the summer when many lakes were experiencing algae blooms impacting water clarity.

Overall there was an improvement in water clarity since 2006, the average Secchi depth then was 1.20 ft. compared to 1.39 ft. in 2010. This is likely due to improvements in all water quality parameters that would affect water clarity since 2006.

Water clarity is negatively correlated with the amount of solids contained within a lake



(Figure 2). Therefore when total suspended solids increase the water clarity decreases. Total solids are comprised of total suspended solids, total dissolved solids, total volatile and non volatile solids. Total suspended solids are comprised of sediments, plants and other aquatic organisms that are concentrated in a known amount of solution. In 2010, the average TSS concentration in MC1 was 15.6 mg/L. This was greater than the median of 8.1 mg/L for samples taken in lakes within Lake County between 2000 - 2010, however, it was half the amount that was found in 2006 (30.3 mg/L),

and very similar to the 2003 concentration of 13.7 mg/L. The average non-volatile suspended solids concentration in the lake, those representing sediments, was 0.23 mg/L. The average total volatile solids (TVS), or organic material in solution was 82.4 mg/L which is below the county median of 123.0 mg/L. This means that the water clarity was not due to sediments being distributed in the water, it was more due to organics and dissolved solids. The average conductivity was 0.7876 mS/cm, and was just above the median (0.7800 mS/cm) of all lakes sampled between 2000 and 2010. Conductivity measures the amount of ions present in the water and is correlated to total dissolved solids.

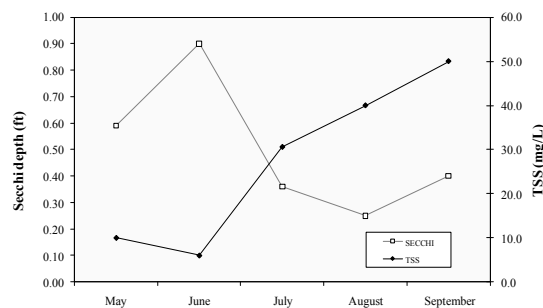


Figure 2. Example of negative correlation between water

NUTRIENTS

During most of the monitoring season MC1 had adequate amounts of both total phosphorus (TP) and nitrogen in the forms of total kjeldahl nitrogen (TKN) and

nitrate-nitrite ($\text{NO}_3 + \text{NO}_2 - \text{N}$) nitrogen to support excessive plant growth and/or algae blooms.

Phosphorus and nitrogen are normally limiting nutrients in our native landscapes. A majority of lakes in Lake County are phosphorus limited, meaning that any



1 LB OF
PHOSPHORUS CAN
PRODUCE 300—
500 POUNDS OF
ALGAE.

NUTRIENTS

addition of phosphorus can have negative impacts due to excessive plant or algae growth. The TN:TP ratio determines which of these nutrients is limiting. A TN:TP ratio of less than 10 indicates that nitrogen is limiting, greater than 20 the system is limited by phosphorus. Between these values, both nutrients are sufficient to cause excessive plant or algal growth.

MC1 had a TP:TN ratio of below 10 in May, however

by June, the ratio had increased to between 10 and 20, indicating that both nutrients were present in amounts capable of promoting excessive plant and algal growth. In 2010, the estimated abundance of vegetation found occurring in the lake support this theory.

Nitrogen is the most difficult of the two nutrients to control as there are atmospheric inputs of nitrogen into our system that is beyond the control of most.

Phosphorus inputs to the environment can be controlled

by following practices that minimize inputs of phosphorus such as not using fertilizers containing phosphorus. Waterfowl can also be a source of phosphorus, however, our notes did not show heavy usage at any one time during our visits.

PHOSPHORUS

MC1 is listed by the IEPA as impaired for phosphorus. The critical value for determining impairment by the IEPA is 0.05 mg/L TP. In 2010, the average TP concentration found in MC1 was 0.088 mg/L. Average TP concentrations have continually decreased from 2006 (0.100 mg/L) and 2003 (0.172 mg/L); however, TP concentrations remained above the standard for the entire monitoring season, ranging from a low of 0.059 mg/L in June to a high of 1.131 mg/L found in May. The average TP concentration (0.08 mg/L) was higher than the median concentration of lakes sampled in Lake County since 2000. MC1 ranked 99th out of 165 lakes sampled for TP during this time period.

MC1 has a TSI_p value of 70.5, which classifies it as a hypereutrophic lake (Table 1). MC1 has an excessive amount of plants living in the lake due to too much nutrient (phosphorus) in the system. Although phosphorus concentrations have been decreasing, it is likely due to the recent wet years (2008-2010) flushing the system as the retention time for MC1 is quite short. Unlike MC2, which receives MC1 effluent, it is probably more influenced by activities within its watershed than through internal nutrient cycling. One of the biggest challenges is removing the nutrient source from the lakes watershed. One positive effort has been made, the Village of Lindenhurst has an ordinance banning the use of phosphorus containing lawn fertilizers.

MC1 is an impounded wetland, and so there is likely internal cycling of nutrients occurring within the lake. MC1 becomes anoxic near the bottom of the lake in the middle of summer causing phosphorus to release from the bottom sediments. Also, as the vegetation in and surrounding the lake senesce some of the nutrients utilized during the growing season by the plants are released back into the environment.

Table 1. Carlson's Trophic State Index	
Trophic State	TSI score
Oligotrophic	<40
Mesotrophic	≥40<50
Eutrophic	≥50<70
Hypereutrophic	≥70

DISSOLVED OXYGEN



In 2010 MC1 had DO concentrations that were considered impaired by state standards. Lakes with DO concentrations measured below 5.0 mg/L at one foot below the surface at any time, are considered impaired for DO. MC1 had DO concentrations at 5.0 mg/L and 4.84 mg/L during July and September respectively (Appendix B). At these levels, fish begin to stress, which can lead to fish kills. Currently, the LCFPD maintains the lake for aesthetics and wildlife habitat (not fish). The DO impairment likely stems from an overabundant plant community, however, the dense vegetation provides water quality benefits by trapping sediments and reducing or eliminating nuisance algal populations. During the peak of the growing season, an increase in water temperature also contributes to the reduction of DO available in the water. The nutrient rich water and sediment along with decaying plant and animal life additionally cause high biological and chemical oxygen demand.

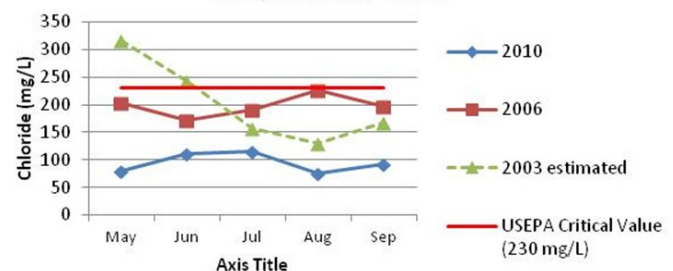
It is not recommended that the LCFPD manage the lake as a fishery due to the low DO concentrations observed in 2010 as well as during other monitoring years. It is further recommended that the weir dam at the outlet remain in place to keep the carp isolated from MC1 as MC2 has an excessive carp population that would only exaggerate the already impaired DO concentrations.

CHLORIDES

In 2010 the chloride concentrations measured in MC1 were the lowest measured in all years that the lake was monitored by LCHD-ES.

The average chloride concentration in 2010 was 95 mg/L which was a 52% decrease from the average concentration recorded in 2006 of 198 mg/L. In 2010 chloride concentrations in MC1 ranged from 75 mg/L to 115 mg/L. All of these measures were below the county median of 142 mg/L and below the chronic chloride concentration (USEPA, 1988).

Figure 3. Seasonal Trends in McDonald Woods Lake #1 Chloride Concentrations, 2003, 2006 and 2010.



Increasing chloride concentrations have been the trend until recently. This is likely an artifact of wet years (2008-2010), diluting the chloride concentration.

The monitoring year 2006, followed a drought year in the region. It is likely that dissolved ions such as chloride, as well as other pollutants became concentrated in the

CHLORIDES CONTINUED

impounded MC1. Since, 2006 the County has experience very wet years. 2009 was one of the wettest years (Ill state climatologist data). In July 2010, a heavy rain event occurred and subsequently the chloride concentration decreased in August, 2010. MC1 has a retention time of 39 days, which suggests that lake waters contained in MC1 are replaced continually within a

years time.

In order to protect lakes from increasing chloride levels, many County agencies and municipalities have started to investigate alternative methods for deicing.

Training their employees on practices that use less road salt but still maintain safe passageways for the public. Reducing road salt (which contains 60% chloride ion) usage can help to reduce

damages that can be caused in our lakes by elevated chloride levels. Heavy salt use on lakes the size and volume of MC1, could cause significant damage to the entire lake ecosystem.



One teaspoon of salt in 5 gallons of water results in a closed system with a chloride level of 280 mg/L.

SHORELINE AND WILDLIFE NOTES



The shoreline of MC1 was evaluated for signs of erosion, although cattail was observed as the dominant plant species along the shoreline, there was no signs of erosion. During a random search for emergent shoreline species patches of native vegetation intertwined within the cattail. These patches contained species

such as common burred, (*Sparganium eurycarpum*), nut sedges (*Cyperus* spp.), blue vervain (*Verbena hastata*), and bee balm (*Monarda fistulosa*) to name a few.

MC1 is situated within McDonald Woods Forest Preserve. There are woodlands, and wetlands surround-

ing the lake's immediate borders. Bluejays, mallards marsh wren and chickadee were some of the birds noted. Damsel and dragon flies, minnows, and green frog were also noted. There is an active beaver dam at the outlet of the lake.

SUBMERSED AQUATIC VEGETATION

In 2010 nine sites were sampled for using the methodology described in Appendix C. The analysis revealed that 100% of the sites sampled contained vegetation. Coontail (*Ceratophyllum demersum*) was the dominant aquatic plant in the lake (pictured at bottom left) representing 90.42% of the Importance. American Elodea (*Elodea canadensis*) was the co-dominant species found in the lake. Out of the nine plant species found in MC1, all but one, Curlyleaf Pondweed, (*Potamogeton crispus*) was native. Three species were found in 2010 that were not found in 2006 using the same methodology. They were, Flatstem Pondweed (*P. zosteriformis*), Giant Duckweed (*Spirodela polyrhiza*), Valesneria (*Valisneria americana*), and Water Stargrass (*Heteranthera dubia*).

The estimated total cover of vegetation in MC1 was 120.28%. This includes layers of vegetation occurring at one point. The abundance of plants found in the lake has

both benefits and drawbacks associated with it. Aquatic vegetation competes with algae for nutrients, and algae blooms were not observed in MC1 in 2010. MC1 had sufficient amounts of both phosphorus and nitrogen present to promote plant and algae blooms and the latter did not happen due to the uptake of nutrients by vegetation. A plankton tow collected in July indicated a diverse microscopic algal plant community that did not result in nuisance populations.

The drawback is that MC1 was impaired for DO, during peak growing periods the lake was depleted by oxygen due to high biological oxygen demand (BOD), of which, the respiration of and the decomposition of organic matter plants were likely a large contributor.

Due to the composition of the plant community being mainly native and the current usage by the District being aesthetic. There are no recommendations for active

management of vegetation in this lake.



Table 2. Average Cover and Frequency of Plants in MC1, 2010.

Common Name	Average Cover	Frequency
Coontail	72.67	100.00
American Elodea	25.17	66.67
Sago Pondweed	12.33	55.56
Duckweed	3.94	33.33
Flatstem Pondweed	1.11	22.22
Giant Duckweed	1.11	22.22
Water Stargrass	2.83	11.11
Curly leaf Pondweed	0.56	11.11
Valisneria	0.56	11.11
Total Average Cover	120.28	

ENVIRONMENTAL SERVICES

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**[http://www.lakecountyl.gov/
Health/want/
BeachLakeInfo.htm](http://www.lakecountyl.gov/Health/want/BeachLakeInfo.htm)**

Protecting the quality of our lakes is an increasing concern of Lake County residents. Each lake is a valuable resource that must be properly managed if it is to be enjoyed by future generations. To assist with this endeavor, Population Health Environmental Services provides technical expertise essential to the management and protection of Lake County surface waters.

Environmental Service's goal is to monitor the quality of the county's surface water in order to:

- Maintain or improve water quality and alleviate nuisance conditions
- Promote healthy and safe lake conditions
- Protect and improve ecological diversity

Services provided are either of a technical or educational nature and are provided by a professional staff of scientists to government agencies (county, township and municipal), lake property owners' associations and private individuals on all bodies of water within Lake County.

RECOMMENDATIONS

The weir dividing McDonald Woods Lake #1 from MC2 remain intact. MC2 is infested with carp, and the weir creates a barrier isolating carp from access to MC1.

It is not recommended that the LCFPD not consider introducing fish into MC1 unless they drastically change the management plan in order to include methods of oxygenating the lake, either through installation of aerators or by reducing the cover of plants.

Reduce chlorides entering the lake from the developed watershed. Educate municipalities on practices that would help to reduce application of deicing materials while providing safe passageways.

LCFPD should be involved in the Volunteer Lakes Management Program, data collected would fill in gaps of missing information that would assist LCHD-ES in future studies as well as help the district in making management decisions for the lake.

